COMPARATIVE ANALYSIS NEITHER MYRIO-1900 VS NOR ELVIS III

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Abstract

From the experiences of working with software, elements, equipment, certifications obtained in LabVIEW and use of hardware tools offered by National Instruments in medium and large scale projects developed in the research group in Modeling-Electronics-Monitoring (MEM) of the Santo Tomas University, a technical comparison has been built between the **NI MyRIO-1900** vs **NI ELVIS III** cards. This comparative analysis between NI devices is built with the purpose of offering students and professionals tools and criteria at the moment or to select any of them for a certain project. This document is then a tool that serves as an example to establish criteria for the selection of equipment according to the requirements that are had and its belonging in the development of competences.

Keywords: MyRIO, NI Elvis III, comparative, tools, experiences, selection

Introduction

It is important to note that as modern technology advances, complex computer systems that surround us today are designed and built. These systems operate transparently for everyone and can perform tasks such as: regulating the temperature in homes, controlling the vehicle's speed on the road, or providing unlimited access to information on a portable device [1]–[4]. Electronic engineering is one of the disciplines that makes the greatest use of these technological systems [5], [6]. During learning experiences, engineering students are [7]often asked to not only master the fundamental elements of the discipline itself, but to develop a complete appreciation of a system designed and built. In order to ensure that they graduate prepared to participate in modern engineering, students should be immersed in real-world systems design long before they finish their studies using the subjects they have been practicing throughout their academic spaces [8]. This document is then a tool that serves as an example to establish equipment selection criteria according to the requirements that are had.

Below is the comparative analysis of **NI MyRIO-1900 vs NI ELVIS II** devices. A qualitative description of them will be found initially and their quantitative characteristics are presented as a comparison.

Comparative analysis

Qualitative characterization of the elements under study

To begin with, a brief description of the National Instruments tools available to Santo Tomas University will be made in a general way.

1. **NI MyRIO-1900**

   This model offers both students and teachers an embedded and WiFi-enabled solution to provide an attractive approach that allows the development of projects with a high rate of creativity and an interdisciplinary approach.

2. **NOR ELVIS III**

   It is an engineering laboratory device developed for project-based learning that combines instrumentation and embedded design with a web-based experience to create an active learning environment in the laboratory, studio and flipped classrooms, enabling a greater understanding of engineering fundamentals and systems design.

With either the NI ELVIS III, or the NI MyRIO, the engineering curriculum can be addressed by integrating project-based learning, teamwork and design with course-specific application cards and laboratories developed either by ourselves or by experts from the education sector and industry.

Quantitative characterization of the elements under study

Once the mentioned equipment is known, a technical comparison is made between them with three different working characteristics. The comparative analysis shown in Table 1 allows to clearly observe that the processing capacity of both devices is basically the same, however, it can also be observed that the main difference in the wireless network, the frequency band used for communication with other devices.

Then comes the question of what are the differences between the frequencies of 2.4GHz and 5GHz, in several documents it is mentioned that the range (coverage) and the bandwidth (speed) provided by the bands. The 2.4GHz band provides coverage over a wider range, but transmits data at slower speeds. The 5GHz band provides less coverage, but transmits data at faster speeds.

Coverage is lower in the 5 GHz band because higher frequencies cannot penetrate solid objects, such as walls and floors. However, higher frequencies allow data to be transmitted faster than lower frequencies, so the 5 GHz band allows you to upload and download files faster.

Table 1. Comparative Analysis: Processing

Specification		**MyRIO**	**NI Elvis III**
Processor	Type	Xilinx Z-7010	Xilinx Z-7020
	Velocity	667 MHz	667 MHz
	Nucleus	2	2
Non-Volatile Memory	Non-Volatile	512 MB	1 GB
Volatile Memory	DDR3	256 MB	512 MB
	Clock Frequency	533 MHz	553 MHz
	Data Bus Width	16 Bits	16 Bits
Wireless network	Radiation Mode	IEEE 802.11 a/b/g/n	IEEE 802.11 a/b/g/n
	Frequency Bands	ISM 2.4 GHz	2.4GHz/5GHz
	Channel Width	20 MHz	20 MHz/40 MHz
	Canals	1 to 13	1 to 13 / 36 to 165
	Security	WPA, WPA2, WPA2-Enterprise	WPA, WPA2, WPA2-Enterprise
Ethernet Network	Network Interface	-	10Base-T, 100Base-TX, and 1000Base-T Ethernet
	Compatibility	-	IEEE 802.3
	Communication Speed	-	10 Mbps, 100 Mbps, 1000 Mbps auto-negotiated
	Maximum Cable Distance	-	100m/segmento

USB ports	USB Host Port	USB 2.0 Hi-Speed	USB 2.0 Hi-Speed, Conector Standard Tipo A, 900 mA
	USB port on the Device	USB 2.0 Hi-Speed	USB 2.0 Hi-Speed, Conector Standard Tipo C

The University's WiFi connection in a particular frequency band can also be faster or slower due to interference from other devices. Many WiFi-enabled technologies and other home devices use the 2.4 GHz band, including microwaves, Bluetooths, etc. When multiple devices try to use the same radio space, device overcrowding occurs. The 5 GHz band tends to have less overcrowding than the 2.4GHz band because it is used by fewer devices and has 23 channels to use, while the 2.4GHz band has only 11 channels.

That is why in the event that the student experiences a lot of interference from other devices, he could consider using the 5 GHz band in the case of using an NI Elvis III if the University has the infrastructure.

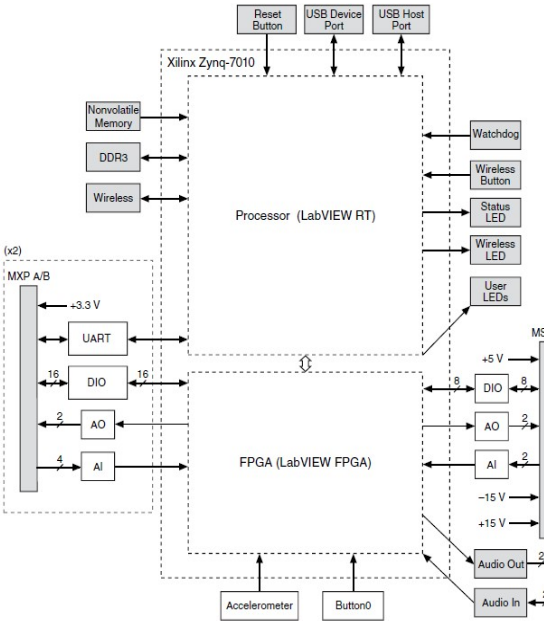
The second analysis corresponds to the input and output characteristics of the devices, both digital and analog. As indicated in Table 2, there are abysmal differences between the two, starting with the quantity, the NI Elvis III has twice the input channels than the NI MyRIO, then, taking into account the resolution, in the case of the NI MyRIO there is only 12 bits of resolution while the NI Elvis III has 16 bits.

Table 2: Comparative Analysis: Control of Inputs and Outputs

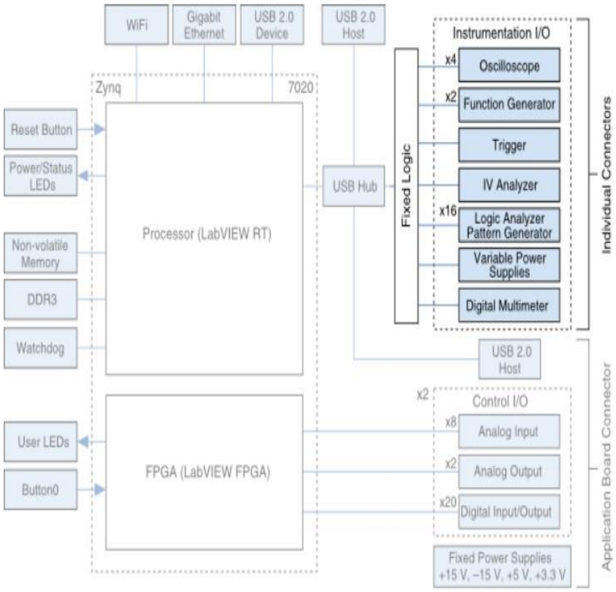
Specification		**MyRIO**	**NI Elvis III**
Analog Input	Number of Channels	8 single-ended and 2 differential	16 single-ended or 8 differential
	Resolution of the ADC	12 bits	16 bits
	Input Range	–10 V, +5 V	–10 V, –5 V, –2 V, –1 V
	Maximum Sampling Frequency	500 kS/s	1 MS/s

Analog Output	Number of Channels	4, capable of independent operation	4, capable of independent operation
	DAC Resolution	12 bits	16 bits
	Output Range	–5 V	–10 V
	Maximum Refresh Rate	345 kS/s	1.6 MS/s
	Slew rate	0.3 V/μs	8.2 V/μs
Digital I/O	Number of Inputs and Outputs	40	40
	Encoder Entry in Quadrature	100 kHz	100 kHz
	SPI	4 MHz	4 MHz
	PWM	100 kHz	100 kHz
	I2C	400 kHz	400 kHz

Taking into account the above, without losing sight of the characteristics of Maximum Sampling Frequency where in the NI Elvis III leads, we can conclude that for data acquisition tasks the NI Elvis III performs a better job.



(a) MyRIO Architecture



(b) Arquitectura Elvis III.

Figure 1: Comparative Analysis of National Instruments Architectures.

As shown in Figure 1, the architecture of the NI Elvis III is similar to that of the MyRIO, in fact, its only difference lies in the instrumentation peripherals it has embedded, these peripherals will be mentioned below:

1. Oscilloscope
2. Function Generator
3. IV Analyzer
4. Trigger
5. Logic Analyzer/Pattern Generator
6. Variable Power Supplies7. Digital Multimeter
7. Digital Multimeter Fuse

Conclusions

With the features presented it is possible to conclude that it is possible to use the front panels to interact with the instruments in the NI ELVIS III without programming. Instruments can also be programmed after installing the NI ELVIS III Software Package. The device could become a substitute/complementary tool for the equipment in the laboratory[9].

A comparative analysis between ni MyRIO and NI Elvis III devices was presented to offer students and professionals tools and criteria when selecting any of them for a given project. The results presented are a tool that serves as an example to establish equipment selection criteria according to the requirements that are had and their belonging in the development of competencies as developer engineers [10], [11].

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